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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/028,979	12/28/2001	Seong-il Cho	1293.1314	3741

21171 7590 07/15/2004

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EXAMINER	
BATTAGLIA, MICHAEL V	
ART UNIT	**PAPER NUMBER**
2652	7

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/028,979	CHO ET AL.
	Examiner	**Art Unit**
	Michael V Battaglia	2652

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 December 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,9-11,13 and 14* is/are rejected.

7)☒ Claim(s) *7,8 and 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5 and 6*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the feedforward table of claim 2, the phase lead-lag controller of claim 4, and the reference and actual signals of claim 5 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Fujiune et al (hereafter Fujiune) (US 6,498,772).

In regard to claim 1, Fujiune discloses an eccentricity compensation apparatus of a disk drive servo system having an actuator (Fig. 1, element 17) actuating a head (Fig. 1, element 10) to a position on a disk (Fig. 1, element 1) rotated by a spindle (Fig. 1, element 50) to read data on or reproduce data from the disk, the apparatus comprising: an error detector (Fig. 1, element 40) that detects a position error between a reference head position and an actual position of the head on the disk; a first compensation controller (Fig. 1, element 41) that receives the position error from the error detector and generates and outputs a first control value to compensate for the position error by changing the actual position of the head; a second compensation controller (Fig. 1,

elements 62 and 63) that generates and outputs a second control value to compensate for eccentricity which varies depending on a phase of the spindle that rotates the disk; and a gain/phase adjuster (Fig. 1, elements 65 and 66) that adjusts gain and phase of the second control value output from the second compensation controller according to a reproduction speed of the disk, wherein a drive signal of the actuator is obtained by summing the signals output from the first compensation controller and the gain/phase adjuster (Fig. 1, element 42).

In regard to claim 9, Fujiune discloses a method of eccentricity compensation of a disk drive servo system having an actuator (Fig. 1, element 17) actuating a head (Fig. 1, element 10) to a position on a disk (Fig. 1, element 1) rotated by a spindle (Fig. 1, element 50) to read data on or reproduce data from the disk, the method comprising: detecting a position error between a reference head position and an actual position of the head on the disk (Fig. 1, element 40); receiving the position error, and generating and outputting a first control value to compensate for the position error by changing the actual position of the head (Fig. 1, element 41); generating and outputting a second control value to compensate for eccentricity which varies depending on a phase of the spindle that rotates the disk (Fig. 1, elements 62 and 63); and adjusting gain and phase of the second control value according to a reproduction speed of the disk (Fig. 1, elements 65 and 66), thereby obtaining a signal to drive the actuator from a summation of the first control value and the adjusted second control value (Fig. 1, element 42).

5. Claims 1, 3, 6, 9, 11, 13 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Yu et al (hereafter Yu) (US 6,147,467). It is noted that in Fig. 7 of Yu, the servo controller (Fig. 7, element 71) is mistakenly labeled as element 73 (Col. 5, line 42).

In regard to claim 1, Yu discloses an eccentricity compensation apparatus of a disk drive servo system having an actuator (Figs. 1 and 2, element 11 and Fig. 2, element 127) actuating a

head (Fig. 1, element 12 and Fig. 7, element 79) to a position on a disk (Fig. 1, element 13) rotated by a spindle (Fig. 1, element 16) to read data on or reproduce data from the disk, the apparatus comprising: an error detector (Fig. 7, element 54) that detects a position error between a reference head position (Fig. 7, element 70) and an actual position (Fig. 7, element 72) of the head on the disk; a first compensation controller (Fig. 7, element 71) that receives the position error from the error detector and generates and outputs a first control value (Fig. 7, element 76) to compensate for the position error by changing the actual position of the head; a second compensation controller (Fig. 7, element 73) that generates and outputs a second control value to compensate for eccentricity which varies depending on a phase of the spindle that rotates the disk (Col. 6, lines 38-40); and a gain/phase adjuster (Fig. 7, element 73 and Col. 5, line 58-Col. 6, line 6) that adjusts gain and phase of the second control value output from the second compensation controller according to a reproduction speed of the disk (Figs. 8(A) and 8(B)), wherein a drive signal (Fig. 7, element 78) of the actuator is obtained by summing the signals output from the first compensation controller and the gain/phase adjuster (Fig. 7, element 67).

In regard to claim 3, Yu discloses that the gain/phase adjuster adjusts the gain and phase of the second control value output from the second compensation controller according to the disk reproduction speed based on frequency response characteristics of the actuator (Col. 5, line 58-Col. 6, line 6).

In regard to claim 6, Yu discloses that the position error between the reference head position and the actual position of the head on the disk corresponds to a displacement of the actuator (Fig. 7, elements 54, 70 and 72). It is noted that the actuator displaces the head to position the head on the disk. Any error in the positioning of the head would then inherently correspond to a displacement of the actuator.

In regard to claim 9, Yu discloses a method of eccentricity compensation of a disk drive servo system having an actuator (Figs. 1 and 2, element 11 and Fig. 2, element 127) actuating a head (Fig. 1, element 12 and Fig. 7, element 79) to a position on a disk (Fig. 1, element 13) rotated by a spindle (Fig. 1, element 16) to read data on or reproduce data from the disk, the method comprising: detecting a position error between a reference head position and an actual position of the head on the disk (Fig. 7, elements 54, 70 and 72); receiving the position error, and generating and outputting a first control value to compensate for the position error by changing the actual position of the head (Fig. 7, elements 71 and 76); generating and outputting a second control value to compensate for eccentricity which varies depending on a phase of the spindle that rotates the disk (Fig. 7, element 73 and Col. 6, lines 38-40); and adjusting gain and phase of the second control value according to a reproduction speed of the disk (Fig. 7, element 73; Figs. 8(A) and 8(B); and Col. 5, line 58-Col. 6, line 6), thereby obtaining a signal to drive the actuator from a summation of the first control value and the adjusted second control value (Fig. 7, elements 67 and 78).

In regard to claim 11, Yu discloses that the adjusting of the gain and phase of the second control value according to the disk reproduction speed is based on frequency response characteristics of the actuator (Col. 5, line 58-Col. 6, line 6).

In regard to claim 13, Yu discloses an eccentricity compensation apparatus of a disk drive servo system having an actuator (Figs. 1 and 2, element 11 and Fig. 2, element 127) actuating a head (Fig. 1, element 12 and Fig. 7, element 79) to a position on a disk (Fig. 1, element 13) rotated by a spindle (Fig. 1, element 16) to read data on or reproduce data from the disk, the apparatus comprising: a controller generating and outputting a control value to compensate for eccentricity at varying reproduction speeds depending on a phase of the spindle that rotates the disk (Fig. 7,

element 73 and Col. 6, lines 38-40); and a gain/phase adjuster adjusting gain and phase of the control value output from the controller at a reproduction speed of the disk based on frequency response characteristics of the actuator (Figs. 8(A) and 8(B) and Col. 5, line 58-Col. 6, line 6).

In regard to claim 14, Yu discloses a method of eccentricity compensation of a disk drive servo system having an actuator (Figs. 1 and 2, element 11 and Fig. 2, element 127) actuating a head (Fig. 1, element 12 and Fig. 7, element 79) to a position on a disk (Fig. 1, element 13) rotated by a spindle (Fig. 1, element 16) to read data on or reproduce data from the disk, the method comprising: generating and outputting a control value to compensate for eccentricity at varying reproduction speeds depending on a phase of the spindle that rotates the disk (Fig. 7, element 73 and Col. 6, lines 38-40); and adjusting gain and phase of the control value at a reproduction speed of the disk based on frequency response characteristics of the actuator (Figs. 8(A) and 8(B) and Col. 5, line 58-Col. 6, line 6).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujiune in view of Drouin (US 5,550,685).

Fujiune discloses that the second compensation controller (Fig. 1, element 63) outputs control data used for compensating the eccentricity via the gain and phase adjustment (Col. 6, lines

42-54). Fujiune does not disclose that the second compensation controller comprises a feedforward look-up table that stores control data estimated at a predetermined reproduction speed.

Drouin discloses a second compensation controller (Fig. 1, element 34) that comprises a feedforward look-up table (Fig. 2, element 40) that stores control data used for compensation via gain and phase adjustment (Col. 5, lines 40-49). Drouin further discloses that by storing the control data in the look-up table, the control data is calculated during a calibration phase of disc operation (Col. 5, lines 23-39). It is noted that the control data is estimated at the reproduction speed used during calibration and that the reproduction speed at which the control data is estimated is therefore predetermined.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to estimate the control data of Fujiune at a predetermined reproduction speed during calibration as suggested by Drouin and for the second compensation controller of Fujiune to comprise a feedforward look-up table that stores the estimated control data as suggested by Drouin, the motivation being to estimate and store the control data beforehand so that calculations of the control data are no longer necessary during normal operation, which allows the frequency at which the eccentricity compensations are made to be increased.

In regard to claim 10, Fujiune discloses control data used for compensating the eccentricity via the gain and phase adjustment (Col. 6, lines 42-54). Fujiune does not disclose that the control data is estimated at a predetermined reproduction speed or that the control data is stored.

Drouin discloses storing control data used for compensation via gain and phase adjustment in a feedforward look-up table (Fig. 2, element 40 and Col. 5, lines 40-49). Drouin further discloses that by storing the control data in the look-up table, the control data is estimated during a

calibration phase of disc operation (Col. 5, lines 23-39). It is noted that the control data is estimated at the reproduction speed used during calibration and that the reproduction speed at which the control data is estimated is therefore predetermined.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to estimate the control data of Fujiune at a predetermined reproduction speed during calibration as suggested by Drouin and to store the control data of Fujiune as suggested by Drouin, the motivation being to estimate and store the control data beforehand so that calculations of the control data are no longer necessary during normal operation, which allows the frequency at which the eccentricity compensations are made to be increased.

7. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu in view of Takeshita et al (hereafter Takeshita) (US 5,479,386).

Yu does not disclose how the first compensation controller is implemented and therefore does disclose that the first compensation controller comprises a phase lead-lag controller to obtain the first control value or that the first compensation controller is a feedback controller that receives a reference signal and an actual signal of the actuator which corresponds to the actual position of the head, to perform a compensation control using the received signals.

Takashita discloses a first compensation controller (Fig. 2A, elements 20A, 22A and 24) that is a feedback controller that receives a reference signal (Fig. 2A, INPUT) and an actual signal (Fig. 2A, OUTPUT) of the actuator (Fig. 2A, elements 18A and 26) which corresponds to the actual position of the head (Col. 5, lines 2-19), to perform a compensation control using the received signals and comprises a phase lead-lag controller (Fig. 2A, elements 22A and 24) to obtain a first control value.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the first compensation controller of Yu in the manner suggested by Takashita, wherein the first compensation controller that is a feedback controller that receives a reference signal and an actual signal of the actuator which corresponds to the actual position of the head, to perform a compensation control using the received signals and comprises a phase lead-lag controller to obtain a first control value, the motivation being to implement the first compensation controller in a known manner.

Citation of Relevant Prior Art

8. Ueno et al (US 6,166,875) discloses an eccentricity compensation apparatus of a disk drive servo system having an actuator (Fig. 2, element 10) actuating a head (Fig. 2, element 13) to a position on a disk (Fig. 1, element 14) rotated by a spindle (Fig. 1, element 15) to read data on or reproduce data from the disk, the apparatus comprising: an error detector (Fig. 2, element 70) that detects a position error between a reference head position and an actual position of the head on the disk; a first compensation controller (Fig. 2, elements 71, 72, 74 and 82) that receives the position error from the error detector and generates and outputs a first control value to compensate for the position error by changing the actual position of the head; a second compensation controller (Fig. 2, elements 8 and 74) that generates and outputs a second control value to compensate for eccentricity which varies depending on a phase of the spindle that rotates the disk, wherein a drive signal of the actuator is obtained by summing the signals output from the first compensation controller and the second compensation controller (Fig. 2, element 73). Szita et al (US 6,751,046) discloses a continuously modified feedforward lookup table (Fig. 13, element 1328) that stores eccentricity compensation amounts (Fig. 2, lines 47-51). Ooi et al (US 6,606,213)

discloses a track servo controller that uses the frequency response of an actuator as an input (Fig. 2). Szita (US 6,411,461) discloses measure the frequency response of an actuator to approximate a transfer function used to offset tracking error (Col. 6).

Allowable Subject Matter

9. Claims 7, 8 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In regard to claims 7, none of the references of record alone or in combination disclose or suggest an eccentricity compensation apparatus of a disk drive servo system having an actuator actuating a head to a position on a disk rotated by a spindle to read data on or reproduce data from the disk, the apparatus comprising: an error detector that detects a position error between a reference head position and an actual position of the head on the disk; a first compensation controller that receives the position error from the error detector and generates and outputs a first control value to compensate for the position error by changing the actual position of the head; a second compensation controller that generates and outputs a second control value to compensate for eccentricity which varies depending on a phase of the spindle that rotates the disk; and a gain/phase adjuster that adjusts gain and phase of the second control value output from the second compensation controller according to a reproduction speed of the disk, wherein a drive signal of the actuator is obtained by summing the signals output from the first compensation controller and the gain/phase adjuster; wherein the second compensation controller comprises a feedforward look-up table that stores control data estimated at a predetermined reproduction speed and used for compensating the eccentricity via the gain and phase adjustment; **wherein the gain/phase**

adjuster compensates for gain reduction and phase lag in frequency response characteristics of the actuator based on the control data in the feedforward look-up table estimated at a predetermined reproduction speed, without updating the control data in the feedforward look-up table each time the reproduction speed changes.

In regard to claim 12, none of the references of record alone or in combination disclose or suggest a method of eccentricity compensation of a disk drive servo system having an actuator actuating a head to a position on a disk rotated by a spindle to read data on or reproduce data from the disk, the method comprising: detecting a position error between a reference head position and an actual position of the head on the disk; receiving the position error, and generating and outputting a first control value to compensate for the position error by changing the actual position of the head; generating and outputting a second control value to compensate for eccentricity which varies depending on a phase of the spindle that rotates the disk; adjusting gain and phase of the second control value according to a reproduction speed of the disk, thereby obtaining a signal to drive the actuator from a summation of the first control value and the adjusted second control value; and **compensating gain reduction and phase lag in frequency response characteristics of the actuator based on control data in a feedforward look-up table estimated at a predetermined reproduction speed, without updating the control data in the feedforward look-up table each time the reproduction speed changes.**

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael V Battaglia whose telephone number is (703) 305-4534. The examiner can normally be reached on 5-4/9 Plan with 1st Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T Nguyen can be reached on (703) 305-9687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M. Battaglia

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Will J Klimowicz

WILLIAM KLIMOWICZ
PRIMARY EXAMINER